

## SUPPLEMENTAL RESTRAINT SYSTEM

[0001] The present invention is a continuation-in-part of U.S. Patent Application Serial No. 09/968,066, filed October 1, 2001, and presently pending, and claims the benefit of the filing date of U.S. Provisional Patent Application No. 60/236,854, filed September 29, 2000.

## FIELD OF THE INVENTION

[0002] The present invention concerns a novel collision survival system for vehicles, specifically the present invention concerns a harness that is worn by the occupants of a car and attaches to the interior of the car.

## BACKGROUND

[0003] There are approximately 3.2 million fatalities and injuries in the United States every year related to automobile and other vehicle accidents. Medical expenses for the 3.2 million injuries and fatalities amount to approximately \$150 billion, exclusive of property damages. Among the 3.2 million fatalities and injuries are approximately 180,000 children under the age of nine.

[0004] Currently, safety equipment in vehicles includes the following:

[0005] Seat Belts:

[0006] Current seat belts are designed to be used in vehicles at any time that an vehicle is running. Often times, vehicle riders do not use their seat belts, generally due to neglect. Further, in case of collision, it has been found that seat belts alone do not provide sufficient protection. It has been determined that certain body parts are not protected by seat belts during collisions, for example, seat belts cannot protect the neck or head area. Also, when seat belts are worn in a collision, the belts cause severe impacts to the body in the areas where they are worn, specifically across the shoulder and belly area.

**[0007] Air Bags:**

**[0008]** Most modern automobiles are provided with air bags. The standard placement of air bags is on the dashboard of the vehicle, generally facing the occupant. When an air bag deploys it typically explodes towards the passenger with great speed and force. Air bags have been known to deploy when not needed, such as when there has not been an accident or when there has been such a slight accident which as not to have required the deployment of the air bag. The deployment of air bags in such cases and in cases of accidents have been known to cause injuries and even fatalities. Further, in cases of severe collisions, air bags have been known to cause severe injury or death to small adults and to children. In addition, the chemical used to inflate the air bag, sodium azide, has been found to be unsafe for some passengers.

**[0009] Child Restraint Systems:**

**[0010]** Most states require that children of a certain age or size be placed in child restraint seats in automobiles. For newborn children and small toddlers the restraints include seats that face towards the rear of the vehicle known as infant car seats. Older children are required to be placed in larger forward facing child restraint seats or car seats and/or booster seats. The requirements for booster seats have recently been found to be necessary for older children who are generally smaller, as the booster seat elevated the child so as to allow a standard seat and shoulder belt to lie correctly on the shoulder and mid- section of the smaller child.

**[0011]** The most common problem with these child restraint seats is the fact that most parents do not use the seats properly. When not used properly, these child restraint systems do not protect the child, may be ineffective in preventing injury or death in an accident and can result in injury to the child. These problems could be solved if parents use the child restraints properly. However, because there are a number of manufacturers of these seats and each manufacturer may utilize a different system of securing the seat to the automobile, it is often difficult for parents and others to know how to properly attach the seat.

## SUMMARY OF THE INVENTION

[0012] The present invention concerns a supplemental restraint system for use in an automobile or vehicle comprising, a harness having restraints for attachment to the seat of an automobile. The harness, which may be of a variety of types, including a series of belts and buckles, or a series of braces and bars resembling a safety cage, or a typical cloth jacket worn as a garment. The harness or the jacket, or a combination of both, is wearable by a rider in the vehicle such that when the rider wears the harness, jacket or combination, the rider is secured to the seat-belt of the vehicle so that the rider remains secured against the seat of the vehicle notwithstanding the motion of the vehicle.

[0013] It will be understood by persons having skill in the art that their are two preferred basic embodiments of the supplemental restraint system that arise from the present invention. Each of these embodiments is tied to the type of restrain system available in the vehicle, either a three point system using a lap and shoulder belt system or a system using merely the lap belt, when that is all that is available. However, other embodiments can be derived without departing from the novel scope of the present invention.

[0014] In a vehicle having a three point adult lap and shoulder belt, typically all of the seating positions, with the exception of the rear central position, has both a lap belt and a shoulder belt. As will be explained in greater detail below, and in the detailed description, the lap portion of the vehicle lap and shoulder belt can be routed through a belt guide located along the lower edge of the jacket/harness and the shoulder belt alone is routed through the belt guide located on the shoulder of the jacket/harness.

[0015] In the second preferred embodiment, the vehicle has a restraint system comprising solely a lap belt. It will be understood that this system is also descriptive of the center rear position in most vehicles having a shoulder belt for all of the other seating positions. A special elastic top tether is provided for use in conjunction with the second embodiment. As will be described in greater detail below, and in the detailed description, the top tether provides upper torso restraint when using a vehicle lap belt only. The lap belt can be

routed through the belt guide located along the lower edge of the jacket/harness; the tether is attached to the jacket/harness at the shoulders and to the vehicle frame at the tether anchor.

[0016] In a preferred embodiment, the supplemental restraint system has restraints that comprise a plurality of belts forming a five point type-restraint system with a system of harnesses and harness assembly connectors allowing the connection of the harness to a modern automobile safety restraint harness system. The modern automobile safety restraint system including tether attachment points for front and rear passengers.

[0017] In another embodiment, the harness system is attached to either a jacket or a vest that allows the harness to be worn outside of the automobile in a fashionable manner and which is then attachable to the seat portions of the automobile.

[0018] In another embodiment, the supplemental restraint system has a sleeve attached to the jacket or vest, the sleeve being slideable over the back portion of the seat. In this manner, the back of the seat of the vehicle provides bracing force to the jacket or vest. In one embodiment, where the jacket resembles an ordinary cloth jacket, extra material may be added to the back panel of the jacket to provide the slideable sleeve. The extra material being hidden in the pattern of the material or in the design of the jacket such that the jacket can be worn outside of the vehicle without appearing to be an incomplete or strange garment.

[0019] In another embodiment, the restraints comprise belts, having buckles, attached to the harness, jacket or vest and buckled together about the seat.

[0020] In another embodiment the jacket, vest or pockets attached to the harness includes air bags, and air bag discharge sensors, strategically placed such that motions which typically cause automobile-type air bags to deploy, cause the jacket, vest or harness air bags to deploy. Further, in one embodiment, the jacket, vest or harness air bags are strategically placed on the garment or harness to provide needed restraint in an air bag deployment incident. Also, in such embodiment, the deployment of the air bags occurs or expands in a direction not diametrically opposite to the movement of the

garment or harness such that the bag does not strike the user of the supplemental restraint system head-on. In this embodiment, an air bag that is placed on or near the chest portion of the garment or harness deploys in the direction that the user is travelling so that the user is not struck by the air bag. This embodiment has the added benefit of providing air bag protection for an automobile that does not have air bags built into the automobile.

[0021] In another embodiment, the harness or garment may be separated from the automobile, such that it may be worn as an ordinary garment, under a garment, or about a garment in a fashionable manner when the user is away from the automobile, and may be reattached upon returning to the automobile.

[0022] The present invention provides a seat belt and supplemental restrain system that includes a number of harness belts, forming, in a preferred embodiment, a five-point harness system, or bars and straps that keep a passenger in his seat and which can include a number of air bags, in association with the harness belts, bars and straps, such that one or more air bags will, upon vehicle impact, inflate upon and about the passenger rather than towards the passenger. In the preferred embodiment of the present invention, means to attach a restraint harness system or a jacket to the automobile seat are provided.

The passenger may be seated within the harness system or jacket and, thus, be provided with a number of belts and/or bars and surrounding air bags, such that injury will be prevented by keeping the passenger in his seat and providing cushioning air bags to surround and protect the passenger. It is to be understood that the restraint system of the present invention may be provided with crash detection sensing devices and may be connected to the vehicle in such a fashion as to utilize crash sensors present in the vehicle and/or which are well known to persons having skill in the art.

[0023] In a further embodiment of the present invention a supplemental restraint system that can resemble an ordinary jacket, such as a leather jacket or a wind-breaker, is envisioned. The jacket has means for sensing that an accident or impact has occurred, or has means to attach the jacket to external sensors or to the sensors conventionally found in a vehicle. The passenger puts the jacket on, in the way one would normally put a jacket on, and sits in the vehicle. The restraint system built into the jacket, including a means to attach the person to

the vehicle seat, such as a wide band of jacket material (which can be as wide and tall as the entire back area of the jacket) is slid over the vertical portion of car seat-back, so as to restrain the person in the seat, and air bags, are built into the jacket.

[0024] The supplemental restraints of the present invention provide a means to protect the passenger with a system that is as easy to use as putting on a jacket.

[0025] The reason for the present invention is to provide a solution to the problems found in prior art seat belts, air bags and child restraint systems.

[0026] When air bags deploy, the speed and direction of the air bag is directly in the reverse direction of travel of the vehicle and the passengers. Accordingly, the impact on a passenger will be the sum of the speed of the vehicle at the moment of impact and the speed of the air bag as it deploys towards the passenger. For example, if the vehicle is traveling at approximately 50 kilometers per hour forward and the air bag deploys at approximately 30 kilometers per hour towards the passenger, then the passenger will feel an impact equal to an approximately 80 kilometer per hour impact. In the present invention, the moving speed and direction of passengers will be almost the same as the moving direction of the air bag deployed, thereby giving the passenger an almost zero extra impact from the air bag deployment.

[0027] Further, due to the design of seat belts, passengers are not protected fully and may be injured at the points of contact with the seat and shoulder belt on the body. The new design solves these problems by providing restraint over a wider area. In one case, bars and straps are used to restrain the passenger to the seat, in one embodiment, and in another embodiment, the passenger may be restrained though out his entire back.

[0028] A more detailed explanation of the invention is provided in the following description and claims and is illustrated in the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Figure 1 is a schematic view of an automobile accident showing the results of an accident in an automobile having restraint systems of the prior art.

[0030] Figure 2 is a schematic view of an automobile accident showing the results of an accident in an automobile having a restraint system of the present invention.

[0031] Figure 3 is a schematic view of an automobile accident showing the results of an accident in an automobile having a restraint system of another embodiment of the present invention.

[0032] Figure 4 is a perspective view of a supplemental restraint system of the present invention.

[0033] Figure 5 is a perspective view of the supplemental restraint system of Figure 4 placed on an automobile seat and being used by a person.

[0034] Figure 6 is perspective view of the supplemental restraint of Figure 5 in a deployed position.

[0035] Figure 7 is a perspective view of another embodiment of the supplemental restraint system of the present invention.

[0036] Figure 8 is another view of the supplemental restraint system of Figure 7.

[0037] Figure 9 is a perspective view of another embodiment of the supplemental restraint system of the present invention.

[0038] Figure 10 is another view of the supplemental restraint system of Figure 9.

[0039] Figure 11 is perspective view of another embodiment of the supplemental restraint system of the present invention.

[0040] Figure 12 is a perspective view of a method of use of the supplemental restraint system of Figure 11.

[0041] Figure 13 is a perspective view of another method of use of the supplemental restraint system of Figure 11.

[0042] Figure 14 is a perspective view of various accessories for use with the supplemental restraint system of Figure 11.

[0043] Figure 15 is a perspective view of various accessories for use with the supplemental restraint system of Figure 11.

#### DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENT

[0044] While the present invention is susceptible of embodiment in various forms, there is shown in the drawings a number of presently preferred embodiments that are discussed in greater detail hereafter. It should be understood that the present disclosure is to be considered as an exemplification of the present invention, and is not intended to limit the invention to the specific embodiments illustrated. It should be further understood that the title of this section of this application ("Detailed Description of an Illustrative Embodiment") relates to a requirement of the United States Patent Office, and should not be found to limit the subject matter disclosed herein.

[0045] Referring to the drawings, Figures 1 through 3 show, schematically, the results of an accident in a vehicle 10 equipped with the restraint systems 12 of the prior art (Figure 1), and of the present invention (Figures 2 and 3). Vehicle 10 comprises a body 14, wheels 16 a passenger seat 18, a shoulder and seat belt 20 a steering wheel 22 and an air bag 24. As can be seen in Figure 1, the impact of an accident in a vehicle 10 traveling at a speed of 50 kph at the moment of impact, causes the deployment of air bag 24, generally at 30kph, out of steering wheel 22 towards the passenger 19. As a result of the accident, passenger 19 is thrown forward by the inertia of the accident and is held by belt 20. It may be seen in Figure 1, that passenger 19 has had its head 26 thrown forward by the impact because passenger's 19 torso 28 has been restrained by belt 20. It will be understood by persons having skill in the art, that while the terms automobile and vehicle are used, somewhat interchangeably within the specification and claims, herein, the device of the present invention can be used in any type of vehicle, including automobiles, trucks, off-road vehicles, utility vehicles, sport utility vehicles, snow-mobiles, motorcycles,



ATV's, boats, other water vehicles, airplanes, jets, rocket ships and other vehicles useable on land, in the water, in the air or in space, without limitation, without departing from the novel scope of the present invention.

[0046] Figure 2 shows a similar accident in a vehicle 10 equipped with the supplemental restraint of the present invention. As can be seen, passenger 19 is restrained against seat 28 by the jacket 30, shown in Figure 6, of the present invention. Head 26 is thrown forward, however, it is restrained from striking steering wheel 22 (or the dash board or other surface for such a system deployed in the front passenger or other seating location in the vehicle) by air bag 24. In the device of the present invention, however, air bag 24 does not travel towards passenger 19, but instead travels with passenger 19, such that upon deployment, away from passenger 19, passenger 19's head 26 is gently supported by air bag 24. Figure 3 shows another embodiment, wherein the passenger travels in a special seat 32, which allows passenger 19 to face away from the general direction of travel. Such travel has been found to be safer than forward facing travel, and in combination with the supplemental restraint of the present invention, provides an extremely safe manner of travel.

[0047] Referring now to Figure 4, a restraint jacket 30 is shown. Restraint jacket 30 comprises a seat back sleeve 40, which in operation is placed onto the seat back 42 of a vehicle seat 18 (Figure 5). Restraint jacket 30 further comprises shoulder bars 44 having head protection air bags 46 and main air bag 48. A system of jacket securing means 50 are also provided, as are means to anchor jacket 30 to a vehicle. Figure 5 shows the placement of jacket 30 onto a vehicle seat and the position of jacket 30 on a person. Figure 6 shows jacket 30 in a deployed condition, with air bags 46 and 48 deployed.

[0048] Figures 7 and 8 show a more conventional jacket 60 which provides similar protection as jacket 30, but which may be worn as a wind breaker or other jacket when not used in a vehicle. It is noted that for small children, jacket 60 allows the child to be dressed at home, and then installed into the vehicle, while being worn, such that placement of a child into a safe restraint system is almost as easy as placing a child onto a seat. Jacket 60 further comprises head protection air bags 62 and a main body air bag 64. Jacket 60 may be fashioned such that it may be closed using buttons or a zipper

in a conventional manner. It is envisioned that various types of materials, including leather, vinyl, nylon, wool, cotton and other man made and natural fabrics may be used in the construction of jacket 60, such that jacket 60 is functional, comfortable (in all weather conditions) and stylish, without departing from the novel scope of the present invention. Jacket 60 further comprises a back sleeve 64 for securing jacket 60 and passenger 18 to a car seat in a manner similar to that illustrated in Figure 5. It is envisioned that sleeve 64 may be made of the same material as jacket 60, so as to hide sleeve 60 when the jacket is worn away from the vehicle or may be made of contrasting materials, colors, or textures, to create a fashion statement of its own, all without departing from the novel scope of the present invention. Sleeve 64 may also be made such that it may be detached from jacket 60 in such a manner as to not effect the integrity of the restraint system of the present invention.

[0049] Referring now to Figures 9 and 10, another embodiment of the restraint jacket 130 of the present invention is shown. Restraint jacket 130 comprises a seat back strap system 140, which comprises a number of straps 142, having buckling mechanisms 143, attached to jacket 130 and arranged such that in operation jacket 130 may be placed onto the seat back 42 of a vehicle seat 18 (shown more clearly in Figure 5). In this manner, restraint jacket 130 may be anchored to the car 10 through seat back 42. In a further embodiment of the present invention, the restraint jacket 130 further comprises shoulder bars having head protection air bags and main air bag, as shown and described with respect to Figures 4 and 5. In this manner, jacket 130 may be equipped with supplemental restraint systems similar to those described above.

[0050] Referring now to Figures 11 - 15, another embodiment of the supplemental restraint system of the present invention, comprising a harness 190, is shown. In the present embodiment, a series of belts 200, of the type used to make seatbelts are used to form harness 190 for use about a person. As shown in Figure 11, a first belt 202 and a second belt 204 are placed in a relative vertical orientation. Belts 202 and 204 are of a sufficient length such that they can reach from the front waist height of a user to the rear waist height of the user, passing over the user's shoulders, in a manner similar to that of a pair of suspenders or brace. In a preferred embodiment, the front portion of belts 202

and 204 are generally parallel to each other and the rear portions cross one over the other such that the rear portions forms an "X". It will be understood by persons having skill in the art that a different configuration of belts 202 and 204, including a configuration where the belts remain parallel in front and back, can be made without departing from the novel scope of the present invention. A third belt 206 is placed in a relative horizontal orientation relative to belts 202 and 204. Belt 206 comprises a first end 206a having a female lock receptor 207, a second end 206b having a male lock portion 209, an outside surface 206c and an inside surface 206d. Belt 206 is further provided with supplemental belt segments 208 and 210, which are attached to belt 206. Belt segment 208 is attached to the inside surface 206c near first belt end 206a and belt segment 210 is attached to the outside surface 206d near second belt end 206b. Belt segment 208 comprises a free end 208a having a male lock portion 208b and belt segment 210 comprises a free end 210a having a female lock receptor 210b. It will be seen that the combination of belt 206 and belt segments 208 and 210 are of a sufficient length to exceed the circumference of the user's waist. It will be understood by persons having skill in the art that means to expand and contract the length of each of belts 202, 204 and 206 can be provided, in a manner well known in the art, such that the series of belts 200 is completely adjustable to the height and girth of any user.

[0051] In a preferred manner of using the harness 190, the user places belts 202 and 204 about the shoulders and secures the belt combination 206, 208 and 210 such that male lock portion 209 on second belt end 206b is attached to female lock receptor 207 on first belt end 206a and male lock portion 208b at end 208a of belt segment 208 is attached to female lock receptor 210b at end 210a of belt segment 210, forming a cross-over belt configuration. It will be understood that a harness that does not include belt segments, such as belt segments 208 and 210 can be used, with the ends of the single belt 206 joining one another in a non-cross-over pattern, without departing from the novel scope of the present invention.

[0052] Referring now to Figures 12 and 13, two preferred concepts of using the harness 190 of the present invention are shown and described. Referring to Figure 12, the harness 190, which is illustrated in Figure 11, is

provided with means 212 for attaching the harness to the seat and shoulder belt system of an automobile. In Figure 12a, a plastic belt clip 212 is shown attached to belt 200 of harness 190, though a first opening 212a and shows a shoulder belt 214 slipped within a second opening 212b. When attached in this manner, harness 190 is secured to the automobile's restraint system, providing security for the user. Figures 12b and 12c illustrate different attaching means 216 and 218. It will be seen that attaching means 216 comprises a carabineer type latch 216a with a ring loop latch 216b. The two latches thus provided 216a and 216b, provide the same means of attachment as clip 212 and can be used to secure a shoulder belt 214 to belt 200 of harness 190. Figure 12c shows a single carabineer 218 type latch having an opening 218c for attachment of a belt 200 to shoulder belt 214 of lap belt (not shown). It will be understood by persons having skill in the art that while plastic clips are shown and described, clips made of other materials, including metals, wood, synthetics and others, can be substituted without departing from the novel scope of the present invention.

[0053] Referring now to Figure 13, the harness 190, which is provided with the attaching means 212 shown in Figure 12, is also provided with tether means 220. In another embodiment, tether means 220, comprised of belts 222 of a type similar to those making up harness 190, are included in the second preferred concept. As illustrated, a first tether 224, comprising a "Y" shaped member having a tether clip 224a (for use with a National Transportation Safety Board required tether anchor) and two attachment means 224b, is provided. It will be understood that attachment means 224b can comprise any type of attachment device, including rings, carabineers, D-ring connectors, or other loop type fasteners, without departing from the novel scope of the present invention. First tether 224 is attachable to a tether anchor, at clip 224a and to two corresponding attachment locations 190b on harness 190. A second tether 226 and third tether 228, each having a tether clip, respectively 226a and 228a are provided, as well as attachment means, respectively 226b and 228a, for use in a manner similar to that described above for first tether 224, attachment means 226b and 228b each being attachable to one of two attachment points 230. Persons having skill in the art will understand that the harness 190 of the present invention can include one or both additional tether means 220 or neither tether

means 220, while still providing protection superior to that presently available, without departing from the novel scope of the present invention.

[0054] In another embodiment extra harness support means are shown and described. While the use of these extra harness means may be desirable in some situations, it will be understood that they are provided as redundant restraint systems. It will be seen, in Figure 13, that a second harness means 192 and a third harness means 194, each of which can be comprised of belts 200 similar to those of first harness means 190, are provided as an alternative to first tether 224, second tether 226 and third tether 228. It will be understood that second 192 and third 194 harness means are particularly useful in older automobiles that do not have the newly required tether anchors. In the use of second 192 and third 194 harness means, second harness 192 means is draped about the automobile seat such that first end segments 192a are hung over the top of the seat and second end segments 192b are placed below the automobile seat. Third harness 194 is provided with means, at first end segments 194a, for attachment to attach locations 190c at the front ends of belts 202 and 204, in a manner similar to the attachment of first tether 224 described above. Third harness 194 is then attachable to second harness 192 using a male-female locking means such as those previously discussed. Second harness means is also attachable to first harness 190, at attachment locations 190b, in a manner similar to that previously described above with respect to first tether 224.

[0055] Figures 14 and 15 illustrate various accessories and systems for attaching the various components to the supplemental restrain systems described herein. It will be understood, by persons having skill in the art, that other types of connection means and systems can be used without departing from the novel scope of the present invention.

[0056] Referring now to Figure 14, harness 190 is shown in use with a Y-shaped tether 275. It will be seen that harness 190 and tether 275 may be connected using D-ring connectors 217. It will be understood by persons having skill in the art, that any type of connector, including but not limited to all of those previously discussed, and others, may be used without departing from the novel scope of the present invention. It will also be understood that tethers

comprising single straps 277 (Figure 15) and comprising four straps 279, as well as other tethers, can be utilized to secure harness 190 to a vehicle, without departing from the novel scope of the present invention. As shown in Figure 14, tether 275 can be of the type having adjustment means 275a, such that tether 275 may be made larger or smaller as needed or desired. Tether 275 is also shown as having a self locking hook 275b of a type well known in the art and now associated with vehicle anchor tethers required in newer vehicles.

[0057] Referring now to Figure 15, a foam backrest 300 is provided to allow a smaller person, or child, to sit on the vehicle seat and be placed in position to have the vehicle shoulder belt reach the correct location on the user's shoulder. It will be understood by persons having skill in the art, that backrest 300 may be constructed of any type of cushioning and resilient materials without departing from the novel scope of the present invention. A second backrest 302 is also shown and can be attached, with such means as hook and eye fasteners 306, to first backrest 300, to allow for the use of a neck restraint 304 in association with the harness 190 of the present invention. Further, as another accessory, a four point harness tether 308 is shown. It will be understood that harness tether 308 can be placed about the back of a vehicle seat with its ends 308a being brought towards the front of the vehicle seat such that end 308a can be connected to various connection points (such as points 212) on harness 190, without the need for a tether anchor in the automobile. The use of harness tether 308 is particularly useful in older vehicles and in vehicles where tethers are not provided in front seats and in other locations where tether anchors are not available.

[0058] Although illustrative embodiments of the invention have been shown and described, it is to be understood that various modifications and substitutions may be made by those skilled in the art without departing from the novel spirit and scope of the invention.